

# **The Student Raindrop Detector (SRD): An Instrument for Measuring Methane Rain on Titan**

Allison Tucker, Gabriel Wilson, Hieu Truong, Tim Kunz, Kysen Palmer, Colton Therrian,  
Jason W. Barnes, David H. Atkinson  
*University of Idaho*

Ralph D. Lorenz  
*JHU/APL*

## **ABSTRACT**

Besides Earth, Saturn's moon Titan is the only other place in the solar system where rain falls onto a solid surface. Although we have evidence that the rain does interact with the surface from erosion patterns, the actual rain itself has not yet been directly measured. Future in situ Titan probes could make this measurement.

We have developed a demonstration instrument capable of detecting Titan's rain. The device is based on a piezoelectric microphone, an instrument concept that has been space qualified on the European Giotto mission to comet Halley, where it listened for dust impacts. The piezoelectric detector is attached to a 10cm-square strike plate that will be exposed to the Titan sky. We will show how monitoring the piezo voltage over time allows us to identify raindrop hits and ascertain their momentum, from which we can calculate the drop's radius given knowledge of the local atmospheric density. In our poster, we will present the instrumental design and the results of tests in both ambient and Titan-relevant environments.

This work has been done by undergraduates at the University of Idaho as an Engineering Senior Design Project with the goal of developing the instrument to TRL 6 for use on the AVIATR Titan Airplane mission. We call it the Student Raindrop Detector (SRD) because it would be included in a mission proposal as a student-built element. It could also be used on Titan atmospheric probes, landers, or airships. Its application to a balloon is not immediately clear, however, given that a gondola will necessarily be in the rain shadow of the balloon itself.